

## IN THE CLAIMS

The following claim set replaces any prior versions of the claims.

- 1                   1.       (withdrawn) A method for making a tunnel valve head with a flux  
2       guide, comprising:  
3                         forming a tunnel valve at a first shield layer, the tunnel valve  
4       comprising a free layer distal to the first shield layer;  
5                         depositing a first insulation layer over the first shield layer and around  
6       the tunnel valve;  
7                         depositing a flux guide over the first insulation layer and coupling to  
8       the tunnel valve at the free layer;  
9                         covering the flux guide with a second insulation layer; and  
10                        forming a second shield layer over the second insulation, wherein the  
11       flux guide and the free layer are physically isolated by the first and second insulation  
12       layers to prevent current shunts therefrom.
- 1                   2.       (withdrawn) The method of claim 1 wherein the depositing the first  
2       insulation layer over the first shield layer and around the tunnel valve is performed  
3       using a self-aligning process wherein regions of different thicknesses are formed with  
4       a single masking step.
- 1                   3.       (withdrawn) The method of claim 1 wherein the flux guide is  
2       physically connected to the free layer of the tunnel valve.
- 1                   4.       (withdrawn) The method of claim 1 wherein the covering the flux  
2       guide with a second insulation layer is performed using a self-aligning process  
3       wherein regions of different thicknesses are formed with a single masking step.
- 1                   5.       (withdrawn) The method of claim 1 wherein the flux guide increases  
2       the amount of magnetic flux in the tunnel valve.

1                   6.       (withdrawn) The method of claim 1 wherein the increase in the  
2       amount of magnetic flux in the tunnel valve enhances the output signal for the tunnel  
3       valve.

1                   7.       (withdrawn) The method of claim 1 wherein the forming a tunnel  
2       valve at a first shield layer further comprises:

3                         forming an antiferromagnetic (AFM) layer of electrically insulating  
4       antiferromagnetic material;

5                         depositing a pinned layer of ferromagnetic material in contact with  
6       said AFM layer, said pinned layer making electrical contact with said first shield;

7                         forming a free layer of ferromagnetic material; and

8                         forming a tunnel junction layer of electrically insulating material  
9       between said pinned and free layers.

1                   8.       (currently amended) A tunnel valve sensor, comprising:

2                         a tunnel valve disposed at a first shield layer, the tunnel valve  
3       comprising a free layer distal to the first shield layer;

4                         a first insulation layer formed over the first shield layer and abutting  
5       the sides of ~~around~~ the tunnel valve;

6                         a flux guide deposited over the first insulation layer and onto a portion  
7       of a first and second side of the tunnel valve, the flux guide ~~being coupled to~~ making  
8       contact with the tunnel valve at the free layer only on the first and second sides of the  
9       tunnel valve with a gap therebetween;

10                        a second insulation layer ~~covering~~ disposed over the flux guide and  
11       onto only a portion of the tunnel valve to encapsulate the flux guide and to leave a  
12       portion of the tunnel valve exposed; and

13                        a second shield layer deposited over the second insulation, wherein ~~the~~  
14       ~~flux guide and the free layer are physically connected, and~~ the flux guide is physically  
15       isolated from the first and second shield layers by the first and second insulation  
16       layers to prevent current shunts therefrom.

1                   9.     (canceled) The tunnel valve sensor of claim 8 wherein the flux guide  
2                   is physically connected to the free layer of the tunnel valve.

1                   10.    (original) The tunnel valve sensor of claim 8 wherein the flux guide  
2                   increases the amount of magnetic flux in the tunnel valve.

1                   11.    (previously presented) The tunnel valve sensor of claim 10 wherein  
2                   the increase in the amount of magnetic flux in the tunnel valve enhances the output  
3                   signal of the tunnel valve.

1                   12.    (currently amended) The tunnel valve sensor of claim 8 wherein the  
2                   tunnel valve further comprises:

3                             an antiferromagnetic (AFM) layer of electrically insulating  
4                   antiferromagnetic material;

5                             a pinned layer of ferromagnetic material in contact with said AFM  
6                   layer, said pinned layer making electrical contact with said first shield;

7                             a free layer of ferromagnetic material; and

8                             a tunnel junction layer of electrically insulating material disposed  
9                   between said pinned and free layers.

1                   13.   (currently amended) A magnetic storage system, comprising:  
2                               a magnetic recording medium;  
3                               a tunnel valve sensor disposed proximate the recording medium, the  
4   tunnel valve sensor, comprising  
5                               a tunnel valve disposed at a first shield layer, the tunnel valve  
6   comprising a free layer distal to the first shield layer;  
7                               a first insulation layer formed over the first shield layer and  
8   abutting the sides of ~~around~~ the tunnel valve;  
9                               a flux guide deposited over the first insulation layer and onto a  
10 portion of a first and second side of the tunnel vale, the flux guide ~~being coupled to~~  
11 making contact with the tunnel valve at the free layer only on the first and second  
12 sides of the tunnel valve with a gap therebetween;  
13                               a second insulation layer ~~covering~~ disposed over the flux guide  
14 and onto only a portion of the tunnel valve to encapsulate the flux guide and to leave a  
15 portion of the tunnel valve exposed; and  
16                               a second shield layer deposited over the second insulation,  
17   wherein ~~the flux guide and the free layer are physically connected, and~~ the flux guide  
18   is physically isolated from the first and second shield layers by the first and second  
19   insulation layers to prevent current shunts therefrom.  
20                               an actuator for moving the tunnel valve sensor across the magnetic  
21   recording disk so the tunnel valve sensor may access different regions of magnetically  
22   recorded data on the magnetic recording medium; and  
23                               a data channel coupled electrically to the tunnel valve sensor for  
24   detecting changes in resistance of the tunnel valve sensor caused by rotation of the  
25   magnetization axis of the free ferromagnetic layer relative to the fixed magnetization  
26   of the pinned layer in response to magnetic fields from the magnetically recorded  
27   data.

1                   14.   (canceled) The magnetic storage system of claim 13 wherein the flux  
2   guide is physically connected to the free layer of the tunnel valve.

1                   15.   (original) The magnetic storage system of claim 13 wherein the flux  
2                   guide increases the amount of magnetic flux in the tunnel valve.

1                   16.   (previously presented) The magnetic storage system of claim 15  
2                   wherein the increase in the amount of magnetic flux in the tunnel valve enhances the  
3                   output signal of the tunnel valve.

1                   17.   (original) The magnetic storage system of claim 13 wherein the tunnel  
2                   valve further comprises:

3                               an antiferromagnetic (AFM) layer of electrically insulating  
4                   antiferromagnetic material;

5                               a pinned layer of ferromagnetic material in contact with said AFM  
6                   layer, said pinned layer making electrical contact with said first shield;

7                               a free layer of ferromagnetic material; and

8                               a tunnel junction layer of electrically insulating material disposed  
9                   between said pinned and free layers.